

CLAIMS

The invention, in which an exclusive property of right I claim, is defined by the claims as follows:

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1-A method and an apparatus for automatically ironing textile articles and the like for both domestic and industrial purposes by utilizing air pressure to smooth and dewrinkle the articles and the like simply by means of high-temperature, high-humidity, and high-pressure air in wet ironing mode and simply by means of high-temperature, and high-
10 pressure air in dry ironing mode, in both of which dewrinkling is done without touching the articles to be ironed by any part of the apparatus or tool like means to provide an additional tension on the textile articles and the like during ironing process and without using any other means such as clamps or cords or inflatable bags and the like for stretching the clothes or the sleeves.

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2-A method and an apparatus for automatically ironing textile articles and the like for both domestic and industrial ironing machines, as claimed in Claim 1, comprising the following stages, each of which are operated and canceled or may be interchanged with each other, and steps of these stages are:

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Stage A): Wet ironing stage

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- controlling if doors are closed or not,
- starting to introduce water from the supply to the system if doors are closed,
- heating the water to produce steam and transferring steam to humidify the textile
25 articles and the like, until a pre-selected humidity level suitable for humidifying the textile articles and the like, is reached,
- compressing air into the system to increase the air pressure to a pre-selected pressure level suitable for dewrinkling,
- stopping to compress air when a pre-selected level of air pressure is reached,
- 30 • heating the air in the system until a pre-selected temperature level is reached,
- measuring the temperature of the air during wet ironing stage,
- stopping to heat the air in the system when measured level of the temperature of the air is equal to or greater than a pre-selected temperature level,

- providing a rest period in order to have enough time for the textile articles and the like to remain in high-temperature, high-humidity, and high-pressure air at pre-selected levels in order to achieve proper dewrinkling ,
- discharging high-temperature, high-humidity, and high-pressure air,

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Stage B) Dehumidifying stage

- starting dehumidifying cycle to remove excess humidity from the textile articles and the like,
- 10 • starting the refrigeration cycle,
- circulating the air through a refrigerating system for dehumidifying high-temperature, high-humidity air ,
- measuring the quantity of water released from the textile articles and the like during dehumidifying process,
- 15 • continuing to cool, dehumidify, and heat the air in order to dry the textile articles and the like completely until measured level of condensation is equal to or lower than a pre-selected level,
- stopping to circulate the air through the refrigerating system when measured level of condensation is equal to or lower than a pre-selected level,
- 20 • stopping refrigerating cycle,

Stage C) Dry ironing stage

- controlling if doors are closed or not,
- 25 • compressing air into the system to increase air pressure to a pre-selected level suitable for dewrinkling and/or drying,
- stopping to compress air when a pre-selected level of air pressure is reached,
- starting to heat the air until a pre-selected temperature level is reached,
- measuring the temperature of the air during dry ironing stage,
- 30 • stopping to heat the air when measured level of the temperature of the air is equal to or greater than a pre-selected temperature level,

- providing a rest period in order to have enough time for the textile articles and the like to remain in high-temperature, high-pressure air at pre-selected levels in order to achieve proper dewrinkling,
- discharging high-temperature, high-pressure air,

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Stage D) Cooling stage

- starting cooling cycle to remove excess heat from the textile articles and the like,
- starting the refrigeration cycle,
- circulating the air through the refrigerating system for cooling high-temperature air ,
- measuring the temperature of the air during cooling process,
- continuing to cool the air in order to dry the textile articles and the like completely until measured level of temperature level is equal to or lower than a pre-selected level,
- stopping to circulate the air through refrigerating system when measured level of temperature level is equal to or lower than a pre-selected level,
- stopping the refrigerating cycle,

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Stage E) Finishing stage

- stopping the ironing cycle,
- measuring the temperature and pressure of the air,
- keeping the textile articles and the like locked until measured level of the temperature and pressure of the air is equal to or lower than a pre-determined level which is safe for the users,
- unlocking.

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3- A method and an apparatus for automatically ironing textile articles and the like as claimed in Claim 1 and Claim 2 wherein said Stage A, Stage B, Stage C, Stage D, and Stage E may be used for dewrinkling of textile articles and the like with high-temperature, high-humidity, and high-pressure air in wet ironing mode, and said Stage C, Stage D, and Stage E may be used for dewrinkling of the items with high-temperature, high-pressure air in dry ironing mode.

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4-A method and an apparatus for automatically ironing textile articles and the like for both domestic and industrial ironing machines as claimed in Claim 1, Claim 2, and Claim 3 comprising

- an electronic control unit(1) to control the operation of the ironing machine,
- 5 • a box like ironing unit (2) comprised of opposite side surfaces at the left and right(3a and 3b), a top surface(4), a rear surface(5), and a front surface(6) locations of which are defined with respect to the user, a door (7) on said front surface(6) or said side surfaces at the left and right(3a and 3b) locking an unlocking of which is operated by said electronic control unit(1), a base part (8) at the bottom of said front surface(6), and a control-panel(9) on said front surface(7) and a container(10) for receiving textile articles and the like into its inner chamber,
- 10 • a heating system(11), to generate steam and to heat the air inside said container(10),
- 15 • an air injection-exhaustion system(12), which injects air into said container and exhausts therefrom,
- a water supplying system(13) for supplying water to the system which is actuated and stopped by said electronic control unit(1),
- a steam generating system(14), to humidify the air inside said container(10),
- 20 • a temperature detecting means(15) for detecting the temperature of the air inside said container(10) which is actuated and stopped by said electronic control unit(1) responsive to said temperature detecting means(15),
- a pressure detecting means(16a) for detecting the pressure of the air inside said container(10) which is actuated and stopped by said electronic control unit(1) responsive to said pressure detecting means(16a),
- 25 • a humidity detecting means(17) for detecting the humidity of the air inside said container(10) which is actuated and stopped by said electronic control unit(1) responsive to said humidity detecting means(17),
- a condensation detecting means(18) for detecting the quantity of water released from the clothes items and the like during the dehumidifying stage (Stage B),
- 30 • an air compressor (19) configured and mounted so as to occupy very low height and disposed below bottom of said container(10) in said base-part(9),
- a compressed air storage tank(20) coupled to said air compressor(19),

- a refrigerating system(21) in order to cool the textile articles and the like and/or to remove excess humidity from them,
- an air supply conduit (22), and air discharge conduit (23a, and 23b)
- a water supply conduit (24), and water discharge conduit (25)

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5-A method and an apparatus for automatically ironing textile articles and the like for both domestic and industrial ironing machines as claimed in Claim 1, Claim 2, and Claim 3 comprising

- an electronic control unit(1) to control the operation of the ironing machine,
- 10 • a box like ironing unit (2) comprised of opposite side surfaces at the left and right(3a and 3b), a top surface(4), a rear surface(5), and a front surface(6) locations of which are defined with respect to the user, a door (7) on said front surface(6) or said side surfaces at the left and right(3a and 3b) locking an unlocking of which is operated by said electronic control unit(1), a base part (8)
- 15 at the bottom of said front surface(6), and a control-panel(9) on said front surface(7) and a container(10) for receiving textile articles and the like into its inner chamber,
- a heating system(11), to generate steam and to heat the air inside said container(10),
- 20 • an air injection-exhaustion system(12), which injects air into said container(10) and exhausts therefrom,
- a water supplying system(13) for supplying water to the system which is actuated and stopped by said electronic control unit(1),
- a steam generating system(14), to humidify the air inside said container(10),
- 25 • a temperature detecting means(15) for detecting the temperature of the air inside said container(10) which is actuated and stopped by said electronic control unit(1) responsive to said temperature detecting means(15),
- a pressure detecting means(16a) for detecting the pressure of the air inside said container(10) which is actuated and stopped by said electronic control unit(1)
- 30 responsive to said pressure detecting means(16a),
- a humidity detecting means(17) for detecting the humidity of the air inside said container(10) which is actuated and stopped by said electronic control unit(1) responsive to said humidity detecting means(17),

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- a condensation detecting means(18) for detecting the amount of water released from the clothes items and the like during the dehumidifying phase (Phase B0,
- an air compressor (19) configured and mounted so as to occupy very low height and disposed below bottom of said container(10) in said base-part(8),
- a compressed air storage tank(20) coupled to said air compressor(19),
- a refrigerating system(21) in order to cool the textile articles and the like and/or to remove excess humidity from them,
- an air supply conduit (22), and air discharge conduit(23a, and 23b) attached to casing of said container(10),

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6- A method and an apparatus for automatically ironing textile articles or the like as claimed in Claim 1 Claim 2, Claim 3, Claim 4, and Claim 5 wherein all the steps of ironing are taking place in a box like structure (2) which is insulated for heat loss and safety in accordance with well known manufacturing methods, comprised of

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- a container(10) for receiving clothes and other textile articles which is resistant to high-temperature, high-humidity, and high-pressure, and which has opposite side surfaces at the left and right(26a and 26b), a top surface(27), a rear surface(28), a bottom surface(29) and a front surface(30) locations of which are defined with respect to the user,

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- a door(31) on said front surface(30) or said side surfaces at the left and right(3a and 3b)of said container(10) which is resistant to high-temperature, high-humidity, and high-pressure, and assuring a perfect closure tightness,

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- a rack(32), which is fixed to said side surfaces(26a and 26b) of said container(10) and to which plurality of hangers(33) are attached for supporting clothes item and the like within the inner chamber of said container(10),

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- a discharge conduit(34) connected preferably to the center of said top surface(4) of said container(10),
- a temperature detecting means(15), a pressure detecting means(16a), a humidity detecting means mounted to said discharge conduit(34) to measure the level of temperature, pressure and humidity in said container,

7- A method and an apparatus for automatically ironing textile articles or the like as claimed in Claim 1 Claim 2, Claim 3 Claim 4, Claim 5, and Claim 6 wherein said air

injection-exhaustion system(12) which expels approximately evenly distributed streams of air into said container(10) to increase air pressure inside its inner chamber, comprises

- an air compressor(19) disposed below said container(10) configured and mounted so as to occupy very low height in said base part(8),
- a compressed air storage tank(20) coupled to said air compressor(19),
- air injection manifold(35),
- air distribution conduits (36a and 36b) preferably located on said rear side of the bottom surface(30) of said container(10) comprised of a first air distribution conduit(36a) coupled to said air compressor(19) and vertically coupled preferably at the back of said rear surface(28) of said container(10), and a second distribution conduit(36b) perpendicularly coupled to said first distribution conduit(36a)
- a plurality of parallelly spaced conduits(37a, 37b, 37c, 37d, 37e, and 37f), perpendicularly coupled to second distribution conduit(36b) and perpendicular to said rear surface(28) of said container(10) and parallel to said bottom surface(29) of said container(10), each of which has formed therein a plurality of spaced air vents(38a, 38b, 38c, 38d, 38e, etc.) and each of which has a length extending from said front surface(30) to said rear surface(28) of said container(10),
- a discharge conduit(34) connected preferably to the center of said top surface(4) of said container(10),
- a lint filter(39) for removing lint from the air circulating in the system which is provided detachably in front of said discharge conduit(34),
- an air supply conduit(22) and an air discharge conduit(23a and 23b),

8- A method and an apparatus for automatically ironing textile articles or the like as claimed in Claim 1 Claim 2, Claim 3 Claim 4, Claim 5, and Claim 6 wherein said air injection-exhaustion system(12) which expels approximately evenly distributed streams of air into said container(10) to increase air pressure inside its inner chamber, comprises

- an air compressor(19) disposed below said container(10) configured and mounted so as to occupy very low height in said base part(8),
- a compressed air storage tank(20) coupled to said air compressor(19),
- air distribution conduits (36a and 36b) preferably located on said rear side of the bottom surface(30) of said container(10) comprised of a first air distribution

conduit(36a) coupled to said air compressor(19) and vertically coupled preferably at the back of said rear surface(28) of said container(10), and a second distribution conduit(36b) perpendicularly coupled to said first distribution conduit(36a)

- 5 • a plurality of parallelly spaced conduits(37a, 37b, 37c, 37d, 37e, and 37f) perpendicularly coupled to second distribution conduit(36b) and perpendicular to said rear surface(28) of said container(10) and parallel to said bottom surface(29) of said container(10), each of which has formed therein a plurality of spaced air vents(38a, 38b, 38c, 38 d, 38e, etc.) and each of which has a length extending
- 10 from said front surface(30) to said rear surface(28) of said container(10),
- a discharge conduit(34) connected preferably to the center of said top surface(4) of said container(10),
- a lint filter(39) for removing lint from the air circulating in the system which is provided detachably in front of said discharge conduit(34),
- 15 • an air supply conduit(22) and an air discharge conduit(23a and 23b),

9- A method and an apparatus for automatically ironing textile articles and the like as claimed in Claim 1 Claim 2, Claim 3, Claim 4, Claim 5, Claim 6, Claim 7, and Claim 8 wherein parallelly spaced conduits(37a, 37b, 37c, 37d, 37e, and 37f) comprised of a pipe

20 and the like on which there are a plurality of spaced air vents(38a, 38b, 38 c, 38d, 38e, etc) the sizes of which increase towards the end of the pipe which is further away from said second distribution conduit(35b) so that air expels upwards, and sideways therefrom with approximately equivalent pressure towards textile items and the like in said container(10),

25 10- A method and an apparatus for automatically ironing textile articles and the like as claimed in Claim 1 Claim 2, Claim 3, Claim 4, Claim 5, Claim 6, Claim 7, and Claim 8 wherein said air injection-exhaustion system(12) comprises two sets of parallelly spaced conduits, one of which (37a, 37b, 37c, 37d, 37e, and 37f) is parallel to said bottom

30 surface(29) of said container(10), the second of which (38f, 38g, 38h, 38i, 38j, 38k) is parallel to top surface(27) of said container(10), above the said hangers(33), and which are perpendicularly coupled to said second distribution conduit(36b) vertically coupled preferably at the back of said bottom surface(29),

11- A method and an apparatus for automatically ironing textile articles or the like as claimed in Claim 1 Claim 2, Claim 4, Claim 5, and Claim 6 wherein said steam generating system(14) comprises

- 5 • a steam generating tank(40) for producing steam to humidify the textiles articles and the like in said container(10)
- a water tank(41) connected to said a steam generating tank(40) which is advantageously removable through a lid(42) to put in demineralized water and/or normal water and also to allow the demineralized water produced during
- 10 the dehumidifying process to be used for known purposes,
- a pump(43) coupled to said water tank(41) for draining the excess water from said water discharge conduit(25),
- a water amount detecting means(44) for measuring the quantity of stored water in said water tank(41),

12- A method and an apparatus for automatically ironing textile articles or the like as claimed in Claim 1 Claim 2, Claim 4, Claim 5, and Claim 6 wherein said heating system(12) which comprises

- a heater (45a) to increase the temperature of the air in side said container(10) until a pre-determined level of temperature is maintained during ironing cycle,
- 20 which is connected to an electrical box (not shown) mounted in said base part(8) from which suitable wiring is provided,
- a temperature detecting means(15) for detecting the temperature of the air inside said container(10) which is actuated and stopped by said electronic control
- 25 unit(1) responsive to said temperature detecting means(15),
- a heater (45b) to heat the water in said steam generating tank(40) for producing steam in order to humidify the textile articles and the like in said container(10) which is connected to said electrical box (not shown) mounted on said bottom surface from which suitable wiring is provided,

13- A method and an apparatus for automatically ironing textile articles or the like as claimed in Claim 1 Claim 2 Claim 4, Claim 5, and Claim 6 wherein a refrigerating system(21) is comprised of evaporator(46) in an air cooling tank(47), condenser(48) in

an air heating tank(49), an expansion valve(50), and a compressor(51) to compress the refrigerant circulating in the refrigerating system, all of which are connected to each other with pipes and the like, a ventilation box(52) to circulate cool air through said air heating tank(49) by means of a fan and a fan motor (not shown) as used in conventional
5 air conditioners in order to cool the condenser(48), a water tank(41) to collect the condensed water during dehumidification stage which is connected to both said air cooling tank(49) and said steam generating tank(40) with a pipe,.

14- A method and an apparatus for automatically ironing textile articles or the like as
10 claimed in Claim 1 Claim 2 Claim 4, Claim 5, and Claim 6 wherein all the steps of ironing are taking place in a box like structure (2) which is insulated for heat loss and safety in accordance with well known manufacturing methods, comprised of a base part (8) at the bottom of said container(10) in which there is said air compressor (19), said compressed air storage tank(20), said steam generating tank(40), said water tank(41)
15 said pump(43), and said air heating tank(49), configured and mounted so as to occupy very low height in said base part(8),

15- A method and an apparatus for automatically ironing textile articles or the like as
claimed in Claim 1 Claim 2 Claim 4, Claim 5, and Claim 6 wherein the operation of the
20 ironing processes is controlled by a multitude of valves(53a, 53b, 53c, 53d, 53e, 53f, 53g, 53h, 53i, 53j, 53k, 53l, 53m, 53n, 53o, 53p, 53r, 53s, 53t and 50),

16- A method and an apparatus for automatically ironing textile articles or the like as
claimed in Claim 1 Claim 2, Claim 3 Claim 4, and Claim 5 wherein said electronic
25 control unit(1) is a microprocessor circuit receiving input signals from temperature detecting means(15), pressure detecting means(16), humidity detecting means(17), condensation detecting means(18), water amount detecting means(44), the door sensor(not shown) coupled to said door(7) of said box like unit(2) and said door(31) of said container(10) as utilized in conventional washing machines, and control panel(9)
30 and sending output signals to drive circuits for activating and stopping the related valves(53a, 53b, 53c, 53d, 53e, 53f, 53g, 53h, 53i, 53j, 53k, 53l, 53m, 53n, 53o, 53p, 53r, 53s, 53t and 50), compressors(19 and 51), pump(42), fan motor(not shown) doors(7 and 31) and the like in order to control:

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- closing and opening of a power feed line(not shown),
- locking and unlocking of said door(7) of said box like unit(2) and said door(31) of said container(10),
- starting and stopping all the stages of ironing cycle(Stage A, B, C, D and E),
- operation of the air injection-exhaustion system(12),
- operation of steam generating system(13),
- operation of heating system(14),
- operation of refrigerating system(21) for cooling and/or dehydrating of textile articles and the like,.

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17- A method and an apparatus for automatically ironing textile articles and the like as claimed in Claim 1 Claim 2, Claim 4, Claim 5, and Claim 6 wherein said rack(32) which may also be slidable along guides(54a, 54b, 54c, and 54d) located at the top(27) or sides(26a and 26b) or both top(27) and sides(26a and 26b) of said container(10) is comprised of four horizontal bars(55a, 55b, 55c, and 55d,) sliding along said guides(54a, 54b, 54c, and 54d) on the top and bottom of both sides(26a and 26b) of said container(10) connected with four vertical bars(56a, 56b, 56c, and 56d) and two perpendicular horizontal bars(57a and 57b) combining the two sides of the rack on which plurality of hangers(33) are attached for supporting clothes items and the like within the interior region of said container(10),

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18- A method and an apparatus for automatically ironing textile articles or the like as claimed in Claim 1, Claim 2, Claim 4, Claim 5, and Claim 6 wherein said rack(32) which may also be slidable along guides(54 and 54b) located at the top(27) or sides(26a and 26b) or both top(27) and sides(26a and 26b) of said container(10) is comprised of two horizontal bars(55a and 55b) sliding along said guides(54a and 54b) on the top of both sides(26a and 26b) of said container(10) connected perpendicularly with a horizontal bar(57) combining the two sides of the rack on which plurality of hangers(33) are attached for supporting clothes items and the like within the interior region of said container(10),

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19- A method and an apparatus for automatically ironing textile articles or the like as claimed in Claim 1, Claim 2, Claim 4, and Claim 5 wherein electronic control unit(1)

starts ironing program after receiving signals from the door sensors that both doors(7 and 31) are closed and unlocks said door(7) of said box like unit(2) and said container(10) if the measured level of temperature inside said container(10) is equal to or lower than a pre-determined level and the level of pressure inside said container(10) is equal to or lower than a pre-determined level in order to provide maximum safety for the users,

20- A method and an apparatus for automatically ironing textile articles or the like as claimed in Claim 1, Claim 2, Claim 4, Claim 5, and Claim 16 wherein said electronic control unit(1) which operates and controls the whole process of the ironing is connected to said control panel(9) on the upper part of said front surface of said (6) box like structure(2) to receive input signals from the buttons of said control panel(9).

21- A method and an apparatus for automatically ironing textile articles or the like as claimed in Claim 1 Claim 2, Claim 3, Claim 4, Claim 5 and Claim 20 wherein said control-panel(9) of said electronic control unit(1) is comprised of an on/off button(58), wet/dry button(59) for dewrinkling in wet ironing mode which is signified by bluish/yellowish color or the like and which starts Stage A, Stage B, Stage C, Stage D, and Stage E one after another when in use, or for dewrinkling in dry ironing mode which is signified by yellowish color or the like and which starts Stage C, Stage D, and Stage E one after another when in use, a humidity level button(60) for setting the required humidity level ranging from no-humidity, to low-humidity, medium-humidity, and high-humidity, a temperature level button(61) for setting the desired temperature which is suitable for the fabrics of the items inside said container(10), a pressure level button(62) for setting the required pressure level ranging from low pressure, to medium pressure, and high pressure suitable for clothes items and the like, a timer (63a) being capable of setting the duration of rest period in wet mode of the ironing process in short, medium, and long periods which is signified by bluish color or the like, and a second timer (63b) being capable of setting the duration of rest period in dry mode of the ironing process in short, medium, and long periods which is signified by yellowish color or the like,

22- A method and an apparatus for automatically ironing textile articles and the like as claimed in Claim 1, Claim 2, and Claim 3 wherein the level of condensation is evaluated

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on the basis of measuring the quantity of water released from the clothes items and the like during the dehumidification stage and generating signals based on this measurement, signals being fed to said electronic control unit(1),

- 5 23- A method and an apparatus for automatically ironing textile articles or the like as claimed in Claim 1 Claim 2, Claim 3, Claim 4, Claim 5, wherein the ironing operation may be of two types, an integral system or split system as utilized in conventional air conditioners and all said elements of the ironing machine(from 1 to 63) is alternatively arranged in a system similar to conventional split system air conditioners in which air
- 10 compressor(19), compressed air storage tank(20), and air heating tank(50) are placed in a second box like unit(64), said box like unit(64) being placed outside the wall behind the box like unit(2) in which dewrinkling of the textile items and the like is done automatically as in previous claims.